

Section 9. Radar Arrivals

5-9-1. VECTORS TO FINAL APPROACH COURSE

Except as provided in para 7-4-2, Vectors for Visual Approach, vector arriving aircraft to intercept the final approach course:

a. At least 2 miles outside the approach gate unless one of the following exists:

1. When the reported ceiling is at least 500 feet above the MVA/MIA and the visibility is at least 3 miles (report may be a PIREP if no weather is reported for the airport), aircraft may be vectored to intercept the final approach course closer than 2 miles outside the approach gate but no closer than the approach gate.

2. If specifically requested by the pilot, aircraft may be vectored to intercept the final approach course inside the approach gate but no closer than the final approach fix.

b. For a precision approach, at an altitude not above the glideslope/glidepath or below the minimum glideslope intercept altitude specified on the approach procedure chart.

c. For a nonprecision approach, at an altitude which will allow descent in accordance with the published procedure.

NOTE-

A pilot request for an "evaluation approach," or a "coupled approach," or use of a similar term, indicates the pilot desires the application of subparas a and b.

d. **EN ROUTE.** The following provisions are required before an aircraft may be vectored to the final approach course:

1. The approach gate and a line (solid or broken), depicting the final approach course starting at or passing through the approach gate and extending away from the airport, be displayed on the radar scope; for a precision approach, the line length shall extend at least the maximum range of the localizer; for a nonprecision approach, the line length shall extend at least 10NM outside the approach gate; and

2. The maximum range selected on the radar display is 150 NM; or

3. An adjacent radar display is set at 125 NM or less, configured for the approach in use, and is utilized for the vector to the final approach course.

4. If unable to comply with subparas 1, 2, or 3 above, issue the clearance in accordance with para 4-8-1, Approach Clearance.

REFERENCE-

FAAO 7110.65, Approach Clearance, Para 4-8-1.

FAAO 7110.65, Final Approach Course Interception, Para 5-9-2.

5-9-2. FINAL APPROACH COURSE INTERCEPTION

a. Assign headings that will permit final approach course interception on a track that does not exceed the interception angles specified in the TBL 5-9-1.

Approach Course Interception Angle

Distance from interception point to approach gate	Maximum interception angle
Less than 2 miles or triple simultaneous ILS/MLS approaches in use	20 degrees
2 miles or more	30 degrees (45 degrees for helicopters)

TBL 5-9-1

b. If deviations from the final approach course are observed after initial course interception, apply the following:

1. Outside the approach gate: apply procedures in accordance with subpara a, if necessary, vector the aircraft for another approach.

2. Inside the approach gate: inform the pilot of the aircraft's position and ask intentions.

PHRASEOLOGY-

(Ident) (distance) MILE(S) FROM THE AIRPORT, (distance) MILE(S) RIGHT/LEFT OF COURSE, SAY INTENTIONS.

NOTE-

The intent is to provide for a track course intercept angle judged by the controller to be no greater than specified by this procedure.

REFERENCE-

FAAO 7110.65, Chapter 5, Section 9, Radar Arrivals, and Section 10, Radar Approaches - Terminal.

c. **EN ROUTE.** When using a radar scope range above 125 NM, the controller shall solicit and receive a pilot report that the aircraft is established on the final approach course. If the pilot has not reported established by the final approach gate, inform the pilot of his/her observed position and ask intentions.

NOTE-

It may be difficult to accurately determine small distances when using very large range settings.

5-9-3. VECTORS ACROSS FINAL APPROACH COURSE

Inform the aircraft whenever a vector will take it across the final approach course and state the reason for such action.

NOTE-

In the event you are unable to so inform the aircraft, the pilot is not expected to turn inbound on the final approach course unless approach clearance has been issued.

PHRASEOLOGY-

EXPECT VECTORS ACROSS FINAL FOR (purpose).

EXAMPLE-

"EXPECT VECTORS ACROSS FINAL FOR SPACING."

REFERENCE-

FAAO 7110.65, Final Approach Course Interception, Para 5-9-2.

5-9-4. ARRIVAL INSTRUCTIONS

Issue all of the following to an aircraft before it reaches the approach gate:

a. Position relative to a fix on the final approach course. If none is portrayed on the radar display or if none is prescribed in the procedure, issue position information relative to the navigation aid which provides final approach guidance or relative to the airport.

b. Vector to intercept the final approach course if required.

c. Approach clearance except when conducting a radar approach. Issue approach clearance only after the aircraft is:

1. Established on a segment of a published route or instrument approach procedure, or see FIG 5-9-1 Example 1.

2. Assigned an altitude to maintain until the aircraft is established on a segment of a published route or instrument approach procedure.

(See FIG 5-9-2 thru FIG 5-9-4.)

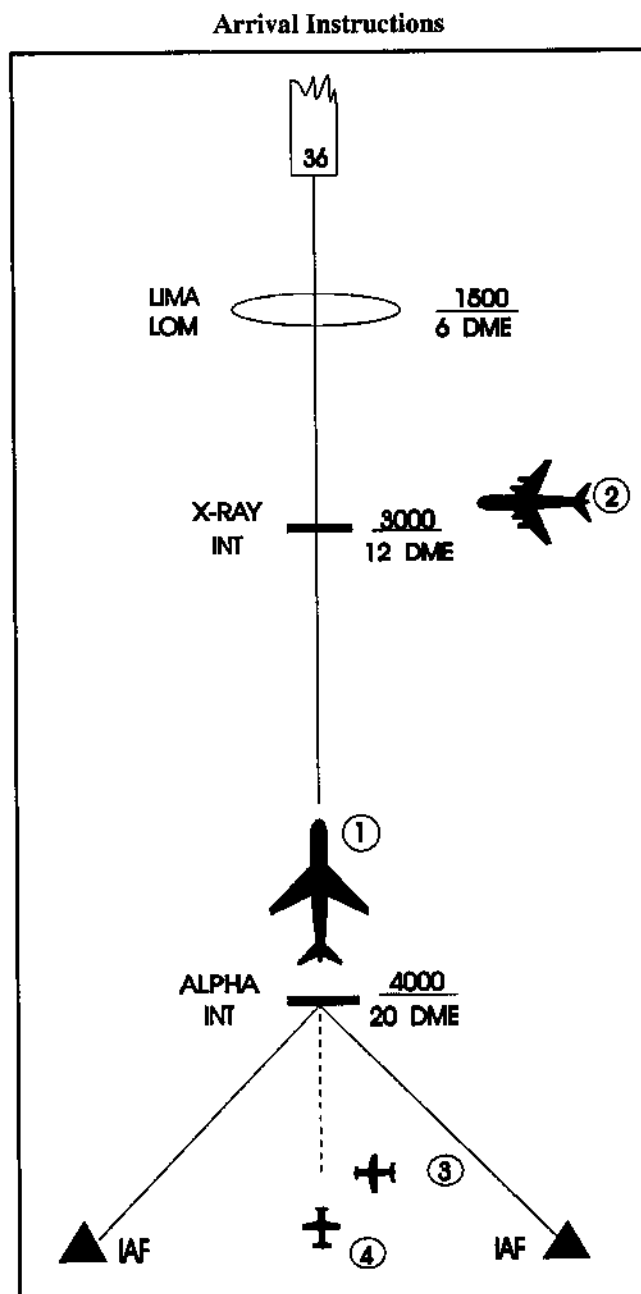


FIG 5-9-1

EXAMPLE-

1. Aircraft 1 was vectored to the final approach course but clearance was withheld. It is now at 4,000 feet and established on a segment of the instrument approach procedure. "Seven miles from X-RAY. Cleared I-L-S runway three six approach." (See FIG 5-9-1.)

2. Aircraft 2 is being vectored to a published segment of the final approach course, 4 miles from LIMA at 2,000 feet. The MVA for this area is 2,000 feet. "Four miles from LIMA. Turn right heading three four zero. Maintain two thousand until established on the localizer. Cleared I-L-S runway three six approach." (See FIG 5-9-1.)

3. Aircraft 3 is being vectored to intercept the final approach course beyond the approach segments, 5 miles from Alpha at 5,000 feet. the MVA for this area is 4,000 feet. "Five miles from Alpha. Turn right heading three three zero. Cross Alpha at or above four thousand. Cleared I-L-S runway three six approach." (See FIG 5-9-1.)

4. Aircraft 4 is established on the final approach course beyond the approach segments, 8 miles from Alpha at 6,000 feet. The MVA for this area is 4,000 feet. "Eight miles from Alpha. Cross Alpha at or above four thousand. Cleared I-L-S runway three six approach." (See FIG 5-9-1.)

Arrival Instructions

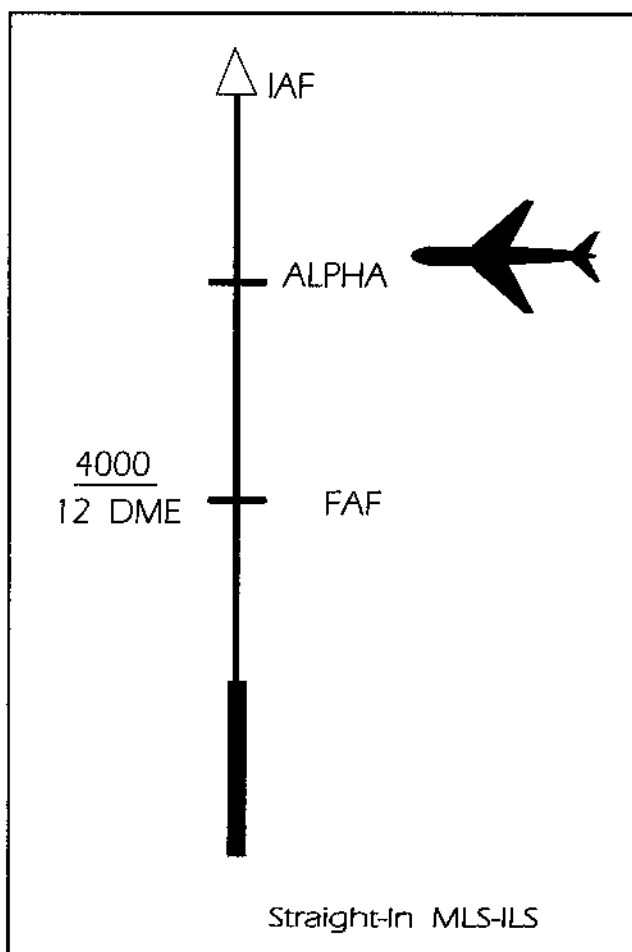


FIG 5-9-2

EXAMPLE-

The aircraft is being vectored to a published segment of the MLS final approach course, 3 miles from Alpha at 4,000 feet. The MVA for this area is 4,000 feet. "Three miles from Alpha. Turn left heading two one zero. Maintain four thousand until established on the azimuth course. Cleared M-L-S runway one eight approach." (See FIG 5-9-2.)

Arrival Instructions

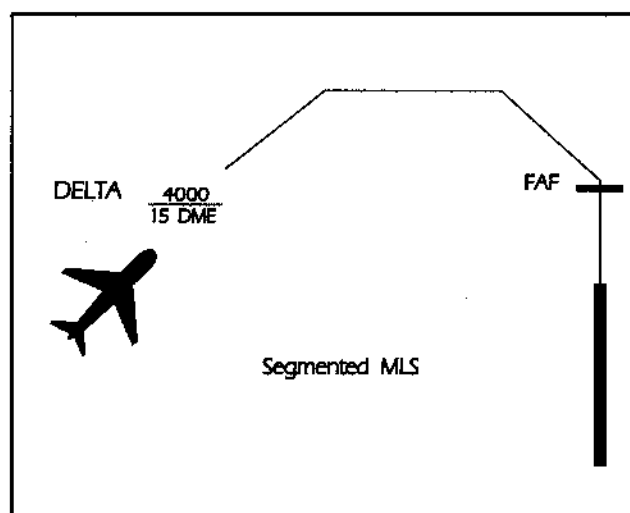


FIG 5-9-3

EXAMPLE-

The aircraft is en route to Delta waypoint at 6,000 feet. The MVA for this area is 4,000 feet. "Cross Delta at or above four thousand. Cleared M-L-S runway one eight approach." (See FIG 5-9-3.)

Arrival Instructions

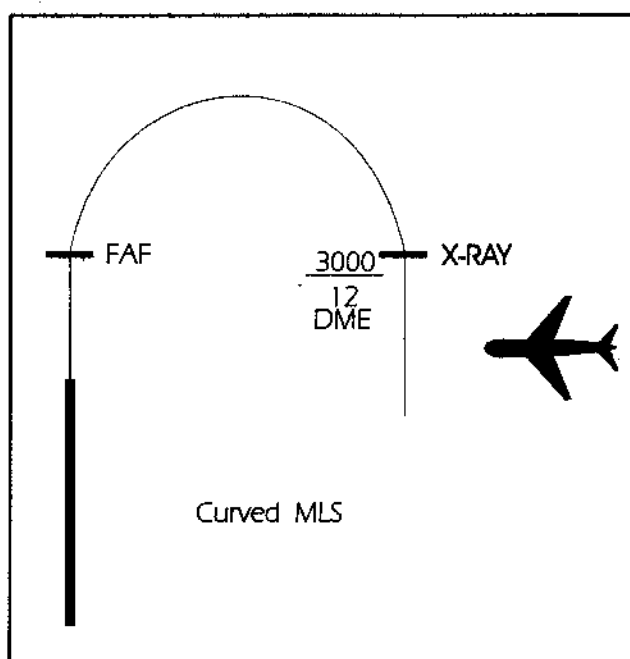


FIG 5-9-4

EXAMPLE-

The aircraft is being vectored to an MLS curved approach, 3 miles from X-ray at 3,000 feet. "Three miles from X-ray. Turn right heading three three zero. Maintain three thousand until established on the azimuth course. Cleared M-L-S runway one eight approach." (See FIG 5-9-4.)

NOTE-

1. The altitude assigned must assure IFR obstruction clearance from the point at which the approach clearance is issued until established on a segment of a published route or instrument approach procedure.

2. If the altitude assignment is VFR-on-top, it is conceivable that the pilot may elect to remain high until arrival over the final approach fix which may require the pilot to circle to descend so as to cross the final approach fix at an altitude that would permit landing.

d. Instructions to do one of the following:

NOTE-

The principal purpose of this paragraph is to ensure that frequency changes are made prior to passing the final approach fix. However, at times it will be desirable to retain an aircraft on the approach control frequency to provide a single-frequency approach or other radar services. When this occurs, it will be necessary to relay tower clearances or instructions to preclude changing frequencies prior to landing or approach termination.

1. Monitor local control frequency, reporting to the tower when over the approach fix.

2. Contact the tower on local control frequency.

REFERENCE-

FAAO 7110.65, Communications Release, Para 4-8-8.

3. Contact the final controller on the appropriate frequency if radar service will be provided on final on a different frequency.

REFERENCE-

FAAO 7110.65, Final Controller Changeover, Para 5-10-8.

4. When radar is used to establish the final approach fix, inform the pilot that after being advised that he/she is over the fix he/she is to contact the tower on local control frequency.

EXAMPLE-

"Three miles from final approach fix. Turn left heading zero one zero. Maintain two thousand until established on the localizer. Cleared I-L-S runway three six approach. I will advise when over the fix."

"Over final approach fix. Contact tower one one eight point one."

NOTE-

ARSR may be used for establishment of initial approach and intermediate approach fixes only. ASR must be used to establish the final approach fix.

REFERENCE-

FAAO 7110.65, Final Approach Course Interception, Para 5-9-2.

FAAO 7110.65, Simultaneous Independent ILS/MLS Approaches- Dual & Triple, Para 5-9-7.

e. Where a Terminal Arrival Area (TAA) has been established to support RNAV approaches, inform the aircraft of its position relative to the appropriate IAF and issue the approach clearance. (See FIG 5-9-5.)

EXAMPLE-

1. Aircraft 1: The aircraft is in the straight in area of the TAA. "Seven miles from CENTR, Cleared R-NAV Runway One Eight Approach."

2. Aircraft 2: The aircraft is in the left base area of the TAA. "Fifteen miles from LEFTT, Cleared GPS Runway One Eight Approach."

3. Aircraft 3: The aircraft is in the right base area of the TAA. "Four miles from WRITR, Cleared FMS Runway One Eight Approach."

5-9-5. APPROACH SEPARATION RESPONSIBILITY

a. The radar controller performing the approach control function is responsible for separation of radar arrivals unless visual separation is provided by the tower, or a letter of agreement/facility directive authorizes otherwise. Radar final controllers ensure that established separation is maintained between aircraft under their control and other aircraft established on the same final approach course.

NOTE-

The radar controller may be a controller in an ARTCC, a terminal facility, or a tower controller when authorized to perform the approach control function in a terminal area.

REFERENCE-

FAAO 7110.65, Wake Turbulence, Para 2-1-19.

FAAO 7110.65, Section 5, Radar Separation, Application, Para 5-5-1.

FAAO 7110.65, Visual Separation, Para 7-2-1.

FAAO 7110.65, Minima, Para 5-5-4.

FAAO 7210.3, Authorization for Separation Services by Towers, Para 2-1-14.

b. When timed approaches are being conducted, the radar controller shall maintain the radar separation specified in para 6-7-5, Interval Minima, until the aircraft is observed to have passed the final approach fix inbound (nonprecision approaches) or the OM or the fix used in lieu of the outer marker (precision approaches) and is within 5 miles of the runway on the final approach course or until visual separation can be provided by the tower.

REFERENCE-

FAAO 7110.65, Receiving Controller Handoff, Para 5-4-6.

FAAO 7110.65, Final Approach Course Interception, Para 5-9-2.

FAAO 7110.65, Parallel Dependent ILS/MLS Approaches, Para 5-9-6.

FAAO 7110.65, Approach Sequence, Para 6-7-2.

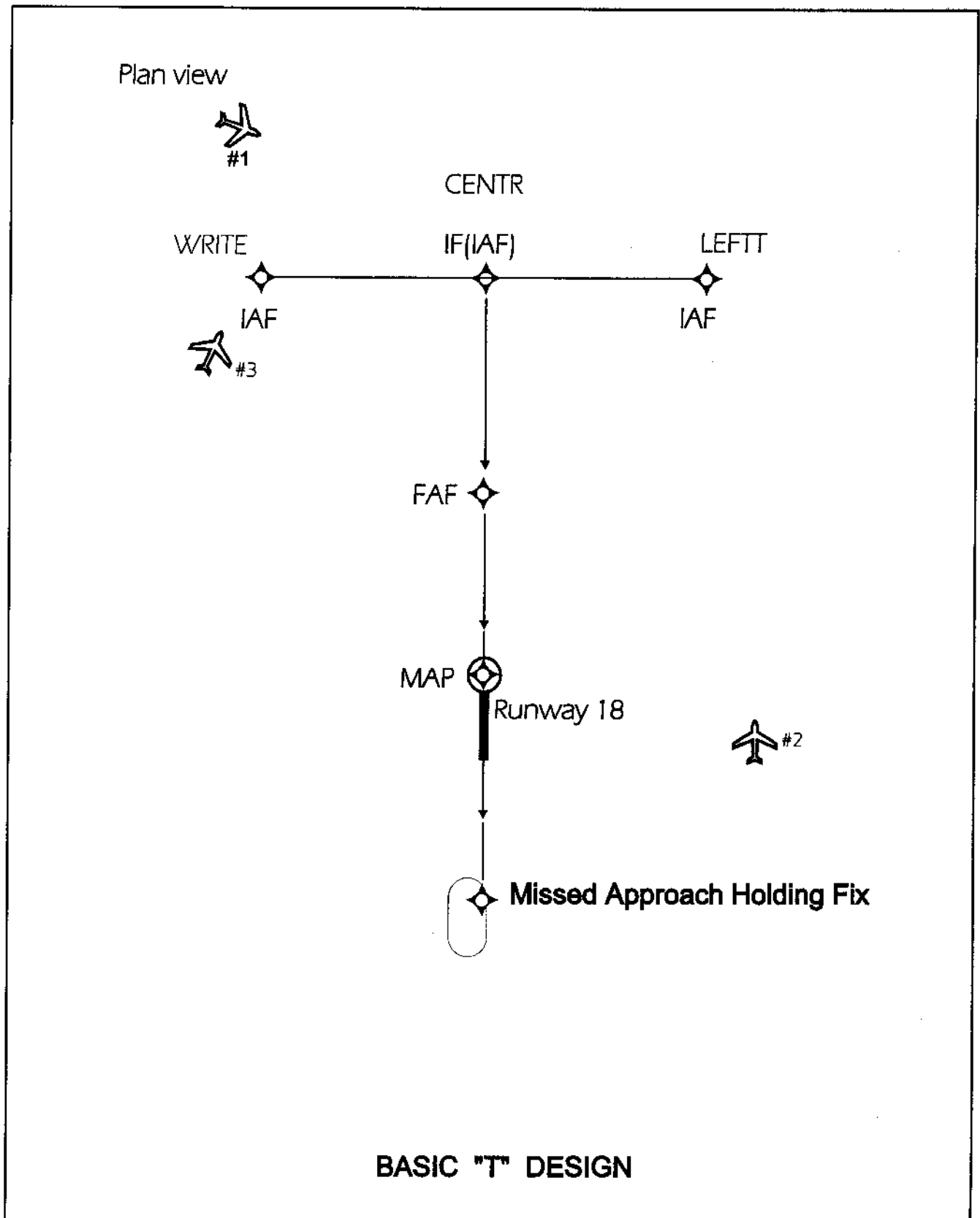


FIG 5-9-5

5-9-6. PARALLEL DEPENDENT ILS/MLS APPROACHES

TERMINAL

a. Apply the following minimum separation when conducting parallel dependent ILS, MLS, or ILS and MLS approaches:

1. Provide a minimum of 1,000 feet vertical or a minimum of 3 miles radar separation between aircraft during turn on.

2. Provide a minimum of 1.5 miles radar separation diagonally between successive aircraft on adjacent localizer/azimuth courses when runway centerlines are at least 2,500 feet but no more than 4,300 feet apart.

Parallel Dependent ILS/MLS Approaches

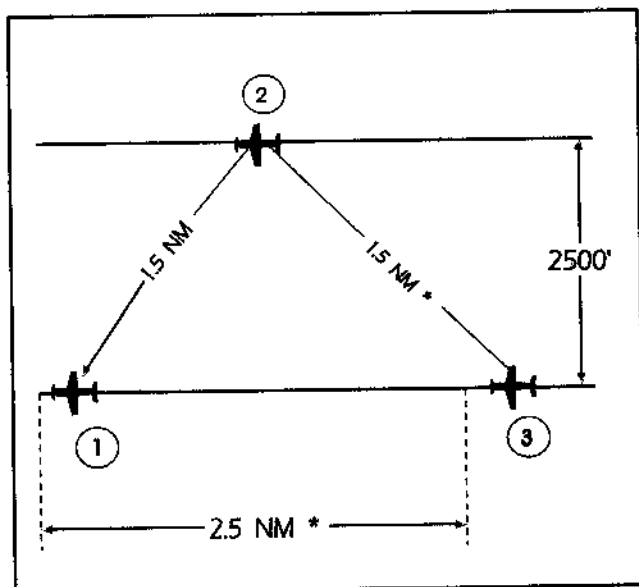


FIG 5-9-6

EXAMPLE-

In FIG 5-9-6, Aircraft 2 is 1.5 miles from Aircraft 1, and Aircraft 3 is 1.5 miles or more from Aircraft 2. The resultant separation between Aircraft 1 and 3 is at least 2.5 miles.

3. Provide a minimum of 2 miles radar separation diagonally between successive aircraft on adjacent localizer/azimuth courses where runway centerlines are more than 4,300 feet but no more than 9,000 feet apart.

Parallel Dependent ILS/MLS Approaches

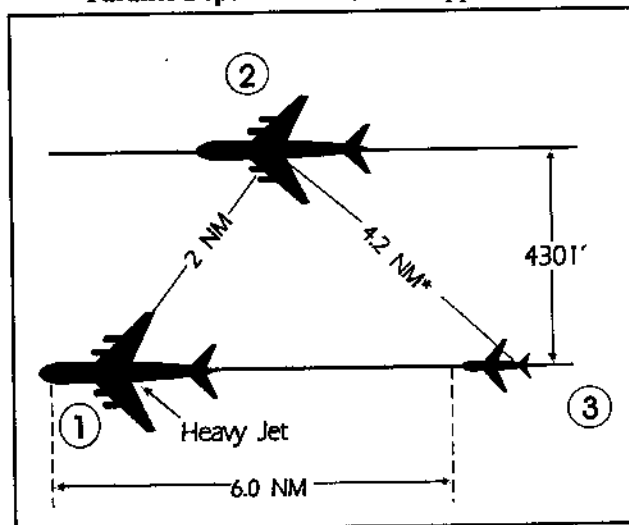


FIG 5-9-7

EXAMPLE-

In FIG 5-9-7, Aircraft 2 is 2 miles from heavy Aircraft 1. Aircraft 3 is a small aircraft and is 6 miles from Aircraft 1. *The resultant separation between Aircrafts 2 and 3 is 4.2 miles.

4. Provide the minimum applicable radar separation between aircraft on the same final approach course.

REFERENCE-

FAAO 7110.65, Section 5, Radar Separation, Minima, Para 5-5-4.

b. The following conditions are required when applying the minimum radar separation on adjacent localizer/azimuth courses allowed in subpara a:

1. Apply this separation standard only after aircraft are established on the parallel final approach course.

2. Straight-in landings will be made.

3. Missed approach procedures do not conflict.

4. Aircraft are informed that approaches to both runways are in use. This information may be provided through the ATIS.

5. Approach control shall have the interphone capability of communicating directly with the local controller at locations where separation responsibility has not been delegated to the tower.

NOTE-

The interphone capability is an integral part of this procedure when approach control has the sole separation responsibility.

REFERENCE-

FAAO 7110.65, Approach Separation Responsibility, Para 5-9-5.
FAAO 7210.3, Authorization for Separation Services by Towers, Para 2-1-14.

c. Consideration should be given to known factors that may in any way affect the safety of the instrument approach phase of flight, such as surface wind direction and velocity, wind shear alerts/reports, severe weather activity, etc. Closely monitor weather activity that could impact the final approach course. Weather conditions in the vicinity of the final approach course may dictate a change of approach in use.

REFERENCE-

FAAO 7110.65, *Final Approach Course Interception*, Para 5-9-2.

5-9-7. SIMULTANEOUS INDEPENDENT ILS/MLS APPROACHES- DUAL & TRIPLE

TERMINAL

a. Apply the following minimum separation when conducting simultaneous independent ILS, MLS, or ILS and MLS approaches:

1. Provide a minimum of 1,000 feet vertical or a minimum of 3 miles radar separation between aircraft during turn-on to parallel final approach.

NOTE-

1. *During triple parallel approaches, no two aircraft will be assigned the same altitude during turn-on. All three aircraft will be assigned altitudes which differ by a minimum of 1,000 feet. Example: 3,000, 4,000, 5,000; 7,000, 8,000, 9,000.*

2. *Communications transfer to the tower controller's frequency shall be completed prior to losing vertical separation between aircraft.*

2. Dual parallel runway centerlines are at least 4,300 feet apart.

3. Triple parallel runway centerlines are at least 5,000 feet apart and the airport field elevation is less than 1,000 feet MSL.

4. A high-resolution color monitor with alert algorithms, such as the final monitor aid or that required in the precision runway monitor program shall be used to monitor approaches where:

(a) Triple parallel runway centerlines are at least 4,300 but less than 5,000 feet apart and the airport field elevation is less than 1,000 feet MSL.

(b) Triple parallel approaches to airports where the airport field elevation is 1,000 feet MSL or more require the high resolution color monitor with alert algorithms and an approved FAA aeronautical study.

5. Provide the minimum applicable radar separation between aircraft on the same final approach course.

REFERENCE-

FAAO 7110.65, *Minima*, Para 5-5-4.

b. The following conditions are required when applying the minimum separation on adjacent dual or triple ILS/MLS courses allowed in subpara a:

1. Straight-in landings will be made.

2. ILS, MLS, radar, and appropriate frequencies are operating normally.

3. Inform aircraft that simultaneous ILS/MLS approaches are in use prior to aircraft departing an outer fix. This information may be provided through the ATIS.

4. Clear the aircraft to descend to the appropriate glideslope/glidepath intercept altitude soon enough to provide a period of level flight to dissipate excess speed. Provide at least 1 mile of straight flight prior to the final approach course intercept.

NOTE-

Not applicable to curved and segmented MLS approaches.

5. An NTZ at least 2,000 feet wide is established an equal distance between extended runway final approach courses and shall be depicted on the monitor display. The primary responsibility for navigation on the final approach course rests with the pilot. Control instructions and information are issued only to ensure separation between aircraft and to prevent aircraft from penetrating the NTZ.

6. Monitor all approaches regardless of weather. Monitor local control frequency to receive any aircraft transmission. Issue control instructions as necessary to ensure aircraft do not enter the NTZ.

NOTE-

1. *Separate monitor controllers, each with transmit/receive and override capability on the local control frequency, shall ensure aircraft do not penetrate the depicted NTZ. Facility directives shall define responsibility for providing the minimum applicable longitudinal separation between aircraft on the same final approach course.*

2. *The aircraft is considered the center of the primary radar return for that aircraft, or, if an FMA or other color final monitor aid is used, the center of the digitized target of that aircraft, for the purposes of ensuring an aircraft does not penetrate the NTZ. The provisions of para 5-5-2, Target Separation, apply also.*

c. The following procedures shall be used by the final monitor controllers:

1. Instruct the aircraft to return to the correct final approach course when aircraft are observed to overshoot the turn-on or to continue on a track which will penetrate the NTZ.

PHRASEOLOGY-

*YOU HAVE CROSSED THE FINAL APPROACH COURSE.
TURN (left/right) IMMEDIATELY AND RETURN TO
LOCALIZER/AZIMUTH COURSE,*

or

*TURN (left/right) AND RETURN TO THE LOCALIZER/
AZIMUTH COURSE.*

2. Instruct aircraft on the adjacent final approach course to alter course to avoid the deviating aircraft when an aircraft is observed penetrating or in the controller's judgement will penetrate the NTZ.

PHRASEOLOGY-

*TRAFFIC ALERT, (call sign), TURN (right/left)
IMMEDIATELY HEADING (degrees), CLIMB AND
MAINTAIN (altitude).*

3. Terminate radar monitoring when one of the following occurs:

(a) Visual separation is applied.

(b) The aircraft reports the approach lights or runway in sight.

(c) The aircraft is 1 mile or less from the runway threshold, if procedurally required and contained in facility directives.

4. Do not inform the aircraft when radar monitoring is terminated.

5. Do not apply the provisions of para 5-13-1, Monitor on PAR Equipment, for simultaneous ILS, MLS, or ILS and MLS approaches.

d. Consideration should be given to known factors that may in any way affect the safety of the instrument approach phase of flight when simultaneous ILS, MLS, or ILS and MLS approaches are being conducted to parallel runways. Factors include but are not limited to wind direction/velocity, wind-shear alerts/reports, severe weather activity, etc. Closely monitor weather activity that could impact the final approach course. Weather conditions in the vicinity of the final approach course may dictate a change of approach in use.

REFERENCE-

FAAO 7110.65, *Radar Service Termination, Para 5-1-13.*
FAAO 7110.65, *Final Approach Course Interception, Para 5-9-2.*

5-9-8. SIMULTANEOUS INDEPENDENT DUAL ILS/MLS APPROACHES- HIGH UPDATE RADAR TERMINAL

a. Authorize simultaneous independent ILS, MLS, or ILS and MLS approaches to parallel dual runways with centerlines separated by at least 3,000 feet with one localizer offset by 2.5 degrees using a precision runway monitor system with a 1.0 second radar update system and when centerlines are separated by 3,400 to 4,300 feet when precision runway monitors are utilized with a radar update rate of 2.4 seconds or less; and

1. Provide a minimum of 1,000 feet vertical or a minimum of 3 miles radar separation between aircraft during turn-on to parallel final approach.

NOTE-

Communications transfer to the tower controller's frequency shall be completed prior to losing vertical separation between aircraft.

2. Provide the minimum applicable radar separation between aircraft on the same final approach course.

REFERENCE-

FAAO 7110.65, *Minima, Para 5-5-4.*

b. The following conditions are required when applying the minimum separation on dual ILS/MLS courses allowed in subpara a:

1. Straight-in landings will be made.

2. ILS, MLS, radar, and appropriate frequencies are operating normally.

3. Inform aircraft that closely spaced simultaneous ILS/MLS approaches are in use prior to aircraft departing an outer fix. This information may be provided through the ATIS.

4. Clear the aircraft to descend to the appropriate glideslope/glidepath intercept altitude soon enough to provide a period of level flight to dissipate excess speed. Provide at least 1 mile of straight flight prior to the final approach course intercept.

NOTE-

Not applicable to curved and segmented MLS approaches.

5. An NTZ at least 2,000 feet wide is established an equal distance between extended runway final approach courses and shall be depicted on the monitor display. The primary responsibility for navigation on the final approach course rests with the pilot. Control instructions and information are issued only to ensure separation between aircraft and to prevent aircraft from penetrating the NTZ.

6. Monitor all approaches regardless of weather. Monitor local control frequency to receive any aircraft transmission. Issue control instructions as necessary to ensure aircraft do not enter the NTZ.

7. Separate monitor controllers, each with transmit/receive and override capability on the local control frequency, shall ensure aircraft do not penetrate the depicted NTZ. Facility directives shall define the responsibility for providing the minimum applicable longitudinal separation between aircraft on the same final approach course.

NOTE-

The aircraft is considered the center of the digitized target for that aircraft for the purposes of ensuring an aircraft does not penetrate the NTZ.

c. The following procedures shall be used by the final monitor controllers:

1. A controller shall provide position information to an aircraft that is (left/right) of the depicted localizer centerline, and in their opinion is continuing on a track that may penetrate the NTZ.

PHRASEOLOGY-

(Aircraft call sign) ISHOWYOU (left/right) OF THE FINAL APPROACH COURSE.

2. Instruct the aircraft to return immediately to the correct final approach course when aircraft are observed to overshoot the turn-on or continue on a track which will penetrate the NTZ.

PHRASEOLOGY-

YOU HAVE CROSSED THE FINAL APPROACH COURSE. TURN (left/right) IMMEDIATELY AND RETURN TO LOCALIZER/AZIMUTH COURSE.

or

TURN (left/right) AND RETURN TO THE LOCALIZER/AZIMUTH COURSE.

3. Instruct aircraft on the adjacent final approach course to alter course to avoid the deviating aircraft when an aircraft is observed penetrating or in the controller's judgement will penetrate the NTZ.

NOTE-

An instruction that may include a descent to avoid the deviating aircraft should only be used when there is no other reasonable option available to the controller. In such a case, the descent shall not put the aircraft below the MVA.

PHRASEOLOGY-

TRAFFIC ALERT, (call sign), TURN (left/right) IMMEDIATELY HEADING (DEGREES), CLIMB AND MAINTAIN (altitude).

4. Terminate radar monitoring when one of the following occurs:

(a) Visual separation is applied.

(b) The aircraft reports the approach lights or runway in sight.

(c) The aircraft has landed or, in the event of a missed approach, is one-half mile beyond the departure end of the runway.

5. Do not inform the aircraft when radar monitoring is terminated.

6. Do not apply the provisions of para 5-13-1, Monitor on PAR Equipment, for simultaneous ILS, MLS, or ILS and MLS approaches.

d. Consideration should be given to known factors that may in any way affect the safety of the instrument approach phase of flight when simultaneous ILS, MLS, or ILS and MLS approaches are being conducted to parallel runways. Factors include but are not limited to wind direction/velocity, wind-shear alerts/reports, severe weather activity, etc. Closely monitor weather activity that could impact the final approach course. Weather conditions in the vicinity of the final approach course may dictate a change of the approach in use.

REFERENCE-

FAAO 7110.65, Radar Service Termination, Para 5-1-13.

FAAO 7110.65, Final Approach Course Interception, Para 5-9-2.